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OFFICE OF
FREVENTION, PESTICIDES, AND
TOXIC SUBSTANCES

FEB 26 1997

MEMORANDUM

Subject:

Permethrin (List B, Case 2510, Chemical 109701).

Magnitude of the Residue in/on Cucumbers and Summer Squash. IR-4. DP Barcode D232398. CBRS 17712. MRID

44182701, 44182702.

From:

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To:

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In response to the Phase 4 Review, IR-4 has submitted additional field trial data for cucumbers and summer squash in support of the cucurbit vegetable crop group tolerance. The study was reviewed by Dynamac Corporation under the supervision of CBRS, HED. The review has undergone secondary review by CBRS and has been revised to reflect Agency policies.

The total permethrin residue in/on cucumbers harvested 0 days after the last of 8 foliar applications of an EC formulation of permethrin at the maximum label rate (0.2 lb. a.i./acre/application) ranged from <0.1 to 0.36 ppm in the present studies, and detected residues for previous studies ranged from 0.11 to 0 52 ppm. The total permethrin residue in/on summer squash (PL) harvested 0 days after the last of 8 foliar applications of an EC formulation of permethrin at the maximum label rate (0.2 lb. a.i./acre/application) was 0.35 ppm and 0.38 ppm. The range of detected residue for all available studies ranged from 0.19 - 0 92 ppm. For melons (not part of the present submission), the range was 0.06 ppm - 1.1 ppm. The current group tolerance of 3 ppm may

be excessive, and the need for a reduced tolerance will be determined at the time of the Reregistration Eligibility Decision Document. No additional field trial data are needed for the cucurbit vegetable group (melon, cucumber, squash).

Please advise if additional information is needed.

Attachment: Permethrin: Registrant's Response to Residue Chemistry Data Requirements (Contract No. 68-D4-0010), 01/29/97

cc with Attachment: S. Funk, RF, Subject File, List B, Patrick Dobak (SRRD), cc without Attachment: circ.

RDI:A. Rathman:02/19/97:R. Perfetti:02/21/97:

7509C:CBRS:S.Funk:305-5430;CM#2:RM803:SF(0297.3):02/18/97:02/24/97.

Attachment:

PERMETHRIN Shaughnessy No. 109701; Case 2510 (CBRS No. 17712; DP Barcode D232398)

Registrant's Response to Residue Chemistry Data Requirements

January 29, 1997

Contract No. 68-D4-0010

Submitted to:
U.S. Environmental Protection Agency
Arlington, VA

Submitted by: Dynamac Corporation 1910 Sedwick Road Building 100, Suite B Durham, NC 27713

Permethrin

(Shaughnessy No. 109701. Case No. 2510)

CBRS No. 17712; DP Barcode D232398

REGISTRANT'S RESPONSE TO RESIDUE CHEMISTRY DATA REQUIREMENTS

BACKGROUND

The Permethrin Phase 4 Review (S. Funk and C. Olinger, 5/91) required additional field trails on cucumbers and summer squash in order to obtain adequate geographical representation for these crops. Data were required depicting residues of permethrin and its metabolites in/on cucumbers from tests conducted in Regions 2 and 5 and in/on summer squash from a test conducted in Region 3. In response, the Interregional Research Project No. 4 (IR-4) has submitted field studies on cucumbers grown in CA, NC, and OH (1996, MRID 44182701) and on summer squash grown in FL (1996, MRID 44182702). These da are reviewed here to determine their adequacy in fulfilling residue chemistry data requirements. The Conclusions and Recommendations stated in this review pertain only to storage stability of residues and the magnitude of the residue in plants.

The nature of the residue in plants is adequately understood based on adequate soybean, cabbage, and sweet corn metabolism studies. The HED Metabolism Committee (C. Olinger, 2/1/96) has concluded that the residues of concern in plant commodities are the *cis*- and *trans*-isomers of both permethrin and DCVA. Tolerances are to be expressed in terms of the parent, *cis*- and *trans*-permethrin only, but the risk assessment will consider residues of *cis*- and *trans*-DCVA in addition to the parent compound.

Tolerances for residues of permethrin are currently expressed in terms of permethrin and its metabolites, 3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropane carboxylic acid (DCVA) and (3-phenoxyphenyl)methanol (3-PBA) in/on animal and plant raw agricultural commodities (RACs) [40 CFR §180.378 (b), (c), and (d)], with the exception of cottonseed. Tolerances

for residues of permethrin in/on cottonseed (0.5 ppm) are expressed in terms of permethrin per se [40 CFR §180.378 (a)]. No food/feed additive tolerances have been established for residues of permethrin. Adequate methods are available for the enforcement of established tolerances, as currently defined.

Once the U.S. tolerance definition is changed to include only permethrin, the Codex and U.S. tolerance expressions for permethrin will be compatible. However, the U.S. tolerance for the cucurbit vegetables crop group is 3 ppm, whereas Codex MRLs (CXL) are 0.5 mg/tg for cucumbers, gherkins, and summer and winter squash and 0.1 mg/kg on melons (except watermelon). Issues regarding the compatibility of the U.S. tolerances and Codex MRLs will be addressed when the reregistration eligibility decision for permethrin is made.

CONCLUSIONS AND RECOMMENDATIONS

- 1. Adequate GC/ECD methods were used to determine residues of permethrin, DCVA, and 3-PBA in/on cucumbers and summer squash. The validated limits of quantitation (LOQs) for these methods are 0.05 ppm for each permethrin isomer, 0.05 or 0.1 ppm for each DCVA isomer, and 0.1 ppm for 3-PBA.
- 2a. The submitted cucumber residue data (MRID 44182701) are adequate. Residues of permethrin were <0.1-0.36 ppm in/on 12 cucumber samples harvested 0 or 1 day following the last of eight foliar applications of permethrin (EC) each at ~0.2 lb ai/A for a total of 1.6 lb ai/A/season (1x the maximum label rate). Residues of DCVA were <0.1-≤0.14 ppm in/on the same 12 samples. Although four samples from the CA test site were not collected at the label-specified PHI (0-day), samples from NC and OH were collected at the proper PHI and additional residue data reflecting a 0-day PHI are already available for CA (0.22 ppm; 0.20 ppm).
- 2b. Together with previously submitted cucumber residue data (1987, MRID 40556801), these data fulfill the requirement for residue data on cucumbers as a representative commodity of the Cucurbit Vegetables Crop Group.
- 3a. The submitted summer squash residue data (MRID 44182702) from FL are adequate Following the last of eight foliar applications of permethrin (EC) at 0.2 lb ai/A/application (1.6 lb ai/A/season; 1x), residues of permethrin were 0.35 and 0.38 ppm in/on two squash samples from the 1995 test that were harvested at a 0-day PHI and <0.1-≤0.12 ppm in/on four samples from the 1992 test that were harvested at a 3-day PHI. Residues of DCVA were ≤0.25 and ≤0.27 ppm in 1995 samples and ≤0.22 ppm in the 1992 samples.
- 3b. Together with previously submitted summer squash residue data (1987, MRID 40556803), these data fulfill the requirement for residue data on summer squash as a representative commodity of the Cucurbit Vegetables Crop Group.

- Adequate residue data on permethrin are now available from a total of 22 field trials on representative cucurbit vegetables (8 cucumber, 7 melon, and 7 summer squash). In each of these studies, crop samples were harvested immediately (0-day) following the last of eight broadcast foliar applications of permethrin at 0.2 lb ai/A/application, for a total of 1.6 lb ai/A/season (1x). Maximum residues of permethrin detected were <0.1-0.52 ppm in/on cucumbers, 0.06-1.1 ppm in/on melons, and 0.19-0.92 ppm in/on summer squashes. These data indicate that the current 3 ppm tolerance is too high and could be lowered to 2 ppm. The tolerance will be reevaluated at the time of the issuance of the *Reregistration Eligibility Decision Document*.
- 5. The EC field trial data for the cucurbits may be translated to the WP formulations. Side-by-side trials with other crops have shown that the residues from EC formulation use are greater to or equal to the WP formulation use residues.

DETAILED CONSIDERATIONS

Residue Analytical Methods

In conjunction with the cucumber and summer squash field studies (1996; MRID 44182701 and 44182702), IR-4 submitted descriptions of GC/ECD methods for analysis of permethrin and its metabolites DCVA and 3-PBA. Sample analyses of cucumbers were performed by the Analytical Support & Food Safety Laboratory (ASFSL), Mississippi State, Mississippi State Univ., MS, and sample analyses of summer squash were performed by the Food and Environmental Toxicology Laboratory (FETL), Univ. of Florida, Gainesville, FL.

Residues of permethrin in/on cucumber samples for CA and OH were determined using the following GC/ECD method, Determination of FMC 33297 Residues in Plant, Animal, and Soil Matrices by Gas Chromatography. G.H. Fujie and O.H. Fuller, J. Agric. Food Chem. Vol. 26, pp. 395-398, 1978, with minor modifications. In brief, residues are extracted with hexane:isopropanol (2:1; v:v), filtered, partitioned with a 10% NaCl solution, and concentrated. Residues are then purified by gel permeation and Florisil column chromatography, and analyzed by GC/ECD. The validated LOQ was 0.025 ppm for each isomer of permethrin.

Residues of permethrin in/on cucumber samples from NC and squash samples from FL were determined using the following GC/ECD method, Analytical Method for the Determination of Permethrin in/on Grapes, Raisins, and Raisin Waste; Analytical Bio-Chemistry Laboratory Report #35579-M, 1987, with minor modifications. For the NC cucumber samples, residues were extracted with acetonitrile (ACN), partitioned into hexane, and concentrated. Residues were then purified by gel permeation and Florisil column chromatography prior to analysis by GC/ECD. For the squash samples, residues were extracted with hexane:isopropanol (2:1; v/v), filtered, partitioned with water, and concentrated. Residues were then purified by

Florisil column chromatography prior to analysis by GC/ECD. The validated LOQ is 0.05 ppm for each isomer of permethrin.

Residues of *cis*- and *trans*-DCVA and 3-PBA in/on all cucumber and squash samples were determined using the following GC/ECD method, *ICI Method No. GRAM-5/2*. For this method, residues are extracted with acetone:ACN (1:1, v/v) followed by ACN:1N HCl (1:1, v/v). The resulting extracts are pooled, filtered, adjusted to pH 9-10, concentrated to remove the ACN, and extracted with dichloromethane (CH₂Cl₂). The CH₂Cl₂ fraction is saved. The aqueous fraction is acidified to pH <0.5, refluxed for 1 hour, and extracted with hexane. The CH₂Cl₂ and hexane fractions are pooled. Residues were derivatized using a mixture of pyridine, trichloroethanol, and heptafluorobutyric anhydride (HFBA) in toluene to simultaneously yield the HFB-ester of 3-PBA and trichloroethyl esters of the DCVA isomers. The derivatized residues were then analyzed by GC/ECD. The validated LOQs are 0.1 ppm for 3-PBA and ~0.05 ppm for each DCVA isomer.

For method validation, control samples of cucumber and squash were fortified separately with permethrin isomers at 0.025-1.0 ppm, DCVA isomers at 0.04-1.0 ppm, and 3-PBA at 0.1-1.0 ppm. Results of the method validation are presented in Table 1; overall method recoveries were 68-119% for permethrin, 71-126% for DCVA, and 74-111% for 3-PBA. Apparent residues of permethrin and its metabolites were below the LOQ for each analyte in/on three control samples of cucumbers and two control samples of squash. Adequate sample calculations, raw data, and representative chromatograms were provided. These data indicate that the above GC/ECD methods are adequate for collecting data on residues of permethrin, DCVA, and 3-PBA in/on cucurbit vegetables.

Table 1. Method recoveries of permethrin and its metabolites DCVA and 3-PBA from fortified control samples of cucumbers and squash using GC/ECD methods.

Analyte	Method	Fortification Number level (ppm) sample		% Recovery	
		Cucumbers			
cis-permethrin	G. Ftijie et. al.,	0.025	2	68, 88	
	1978	0.05	. 4	70-105	
		0.10	2	94, 97	
	•	0.50	2	83, 87	
	ABC Lab Report 35579-M, 1987	0.50	4	94-119	
		1.00	3	78-100	
trans-permethrin	G. Fujie et. al.,	0.025	2	83, 88	
	1978	0.05	4	70-102	
		0.10	2	91, 94	
		0.50	2	87, 90	

Table 1. Continued.

Analyte	Method	Fortification level (ppm)	Number of samples	% Recovery	
	ABC Lab Report	0.50	4	98-119	텝
	35579-M, 1987	1.00	3	83-104	
	Cı	icumbers (continue	ed)		1
cis-DCVA	ICI Method No.	0.04	3	83-113	
	GRAM - 5/2	0.40	4	71-86	T
trans-DCVA		0.06	3	85-122	T
		0.60	4	82-85	T
3-PBA		0.10	3	100-111	17
		1.00	4	86-96	
		Summer Squash			T
cis-permethrin	ABC Lab Report	0.05	4	82-96	
	35579-M, 1987	1.00	7	71-90	
trans-permethrin		0.05	4	94-110	
		1.00	7	70-88	
cis-DCVA	ICI Method No.	0.10	3	88-96	T
	GRAM - 5/2	0.50	1	126	\top
		1.00	4	88-107	
trans-DCVA		0.10	3	74-78	
		0.50	1	100	\top
		1.00	4	75-99	\top
3-PBA		0.10	3	· 74-94	T
		0.50	1	75	\top
		1.00	4	91-101	

Storage Stability Data

In conjunction with the magnitude of the residue study on squash, IR-4 submitted data on the stability of permethrin, DCVA, and 3-PBA in frozen summer squash. Separate control samples of squash were fortified with permethrin isomers at 0.05-2.0 ppm, DCVA isomers at 0.5 and 2.0 ppm, and 3-PBA at 0.5 and 2.0 ppm and stored at <0 C. Stored samples fortified with permethrin were analyzed after 314 days of storage along with freshly fortified control samples, and stored samples fortified with DCVA or 3-PBA were analyzed after ~495 days of storage along with freshly fortified control samples. Results of the analyses are presented in Table 2.

The submitted storage stability data would seem to indicate that residues of permethrin are stable in frozen cucurbit vegetables for up to 314 days and that residues of DCVA and 3-PBA are stable for up to 495 days. However, these data are not adequate because fortified samples were not analyzed prior to storage to provide data from a zero time point for comparison to results from the stored samples.

Table 2. Storage stability of permethrin, DCVA, and 3-PBA in frozen summer squash.

Analyte	Fortification level (ppm)	Storage Interval (days)	Uncorrected % Recovery	Corrected % Recovery ^a	
cis-permethrin	0.05	314	96	100	Ħ
	0.50	Γ	77	99	П
	2.00	·	76	98	П
trans-permethrin	0.05	314	98	89	П
<i>Trans</i> -permeum m	0.52	[77	102	П
	2.03		78	103	
cis-DCVA	0.49	497	121	96	
	2.05	· · ·	115	91	
	0.50	497	96	95	П
trans-DCVA	2.03	_	97	97	П
3-РВА	0.50	495	72	96	
	2.03		72	96	

^a Recoveries of each analyte were corrected using concurrent sample recoveries.

Samples from the cucumber field studies (MRID 44182701) were frozen on the day of collection and stored at \leq -15 C for up to 24 days prior to shipment by freezer truck to the analytical laboratory (ASFSL). Samples were stored at \leq -10 C at the analytical laboratory Prior to extraction for analysis, samples were stored frozen for a maximum of 574 days (\sim 19 months). Samples from the squash field studies (MRID 44182702) were transferred directly to the analytical laboratory (FETL) and frozen. Samples from the 1992 and 1995 squash field studies were stored frozen for a maximum of 479 and 29 days, respectively, prior to analysis.

Although the storage stability data included in the current submission are not adequate, sufficient storage stability data are available for permethrin and its metabolites in crop plans to support the storage intervals and conditions under which residue samples were held for the current studies.

Magnitude of the Residue in Plants

Cucurbit Vegetables Crop Group

A tolerance of 3 ppm has been established for the combined residues of permethrin and its metabolites. DCVA and 3-PBA, in/on cucurbit vegetables [40 CFR §180.378 (b)].

A REFS search dated 7/15/96 listed six permethrin end-use products registered to Zeneca Ag Company and FMC Corporation for use on cucurbit vegetables; these products include four 25% WPs, a 2 lb/gal EC, and a 3.2 lb/gal EC. Permethrin is registered for up to eight foliar broadcast applications to cucurbit vegetables at a maximum of 0.2 lb ai/A/application for a maximum of 1.6 lb ai/A/season. Applications can be made in a minimum of 4 or 5 gal/A using aerial equipment or a minimum of 20 gal/A using ground equipment. Crops can be harvested on the day (0-day) of application. A minimum retreatment interval is not specified.

Cucumbers. The Permethrin Phase 4 Review (5/91) required additional data depicting residues of permethrin and its metabolites in/on cucumbers from tests conducted in Regions 2 and 5. In response, IR-4 submitted data (1996; MRID 44182701) from three tests conducted in CA, NC, and OH depicting residues of permethrin, DCVA, and 3-PBA in/on cucumbers harvested 0 or 1 day following the last of eight applications of permethrin (2 lb/gal EC) at ~0.2 lb ai/A, for a total of 1.6 lb ai/A/season (1x). Applications were made using ground equipment at 25-55 gal/A at retreatment intervals of 4 to 11 days.

One control and four treated samples were harvested from each test 2 to 22 hours following the last of eight applications. Samples were frozen on the day of sampling and held at ≤-10 C for a maximum of 574 days prior to extraction for analysis. The available storage stability data adequately support the storage intervals and conditions under which residue samples were held for the current study.

Residues of permethrin and its metabolites were determined using adequate GC/ECD methods described in the Residue Analytical Method section of this report. The reported LOQ is 0.05 ppm for each permethrin isomer, 0.05 ppm for each DCVA isomer, and 0.1 ppm for 3-PBA. Apparent residues of permethrin and DCVA were below the LOQs in/on the three control samples. Residues of permethrin (cis + trans isomers) were <0.1 ppm in/on the four samples from CA harvested 22 hours (1 day) posttreatment and <0.1-0.36 ppm in/on the eight samples harvested by 4 hours posttreatment from NC and OH (Table 3). Residues of DCVA (cis + trans isomers) were <0.1- \leq 0.14 ppm.

The submitted cucumber residue data are adequate. Although samples from the CA test site were not collected at the label-specified PHI (0-day), samples for the NC and OH tests were collected at the proper PHI and adequate data reflecting a 0-day PHI are already available for CA (0.22 ppm; 0.20 ppm).

When considered with previously submitted cucumber residue data (MRID 40556801), geographic representation of the residue data is adequate for cucumbers. A total of eight tests reflecting the maximum use rate and the 0-day PHI have been conducted on cucumber in CA(2), IN. NC, NY, OH, TX(2). Together with previously submitted cucumber residue data (MRID 40556801), these data fulfill the requirement for residue data on the representative commodity cucumbers.

Summer Squash. The Permethrin Phase 4 Review (5/91) required additional data depicting residues of permethrin and its metabolites in/on summer squash from a test conducted in Region 3. In response, IR-4 submitted data (1996; MRID 44182702) depicting residues of permethrin, DCVA, and 3-PBA in/on summer squash from two tests conducted in FL during 1992 and 1995. In the 1992 study, eight broadcast foliar applications of permethrin (2 lb/gal EC), each at 0.2 lb ai/A (1x), were applied to squash plants at retreatment intervals of 6 to 7 days using ground equipment at 30 gal/A. One control and four treated samples were harvested 3 days following the last application. In the 1995 study, eight broadcast foliar applications of permethrin (3.2 lb/gal EC), each at 0.2 lb ai/A (1x), were applied to squash plants at retreatment intervals of 4 to 5 days using ground equipment at 30 gal/A. One control and two treated samples were harvested 12 hours (0-day PHI) following the last application.

Samples from each test were transported directly to the analytical laboratory (FETL) on the day of collection and placed into frozen storage. Samples from the 1992 and 1995 squash field trials were stored frozen for a maximum of 479 and 29 days, respectively, prior to analysis. The available storage stability data adequately support the storage intervals and conditions under which residue samples were held for the current study.

Residues of permethrin and its metabolites were determined using adequate GC/ECD methods described in the Residue Analytical Method section of this report. The validated LOQs are 0.05 ppm for each permethrin isomer and 0.1 ppm for each DCVA isomer and 3 PBA. Apparent residues of permethrin and DCVA were below the LOQs for each analyte (<0.05 and <0.1 ppm) in/on the two control samples. Residues of permethrin (cis + trans isomers) were ≤ 0.12 ppm in/on the four samples from 1992 harvested 3 days posttreatment and 0.35 and 0.38 ppm in/on the two samples from 1995 harvested 12 hours posttreatment (Table 4). Residues of DCVA (cis + trans isomers) were ≤ 0.22 ppm in the 1992 test and ≤ 0.27 ppm in the 1995 test.

The submitted squash residue data from the 1995 study are adequate. Although samples from the 1992 test were collected later (3-day PHI) than the label-specified 0-day PHI, samples for the 1995 test reflected the maximum use rate and were collected at the proper PHI. Together with previously submitted squash residue data (MRID 40556803), these data fulfill the requirement for residue data on the representative commodity summer squash.

When considered with earlier summer squash residue studies (MRID 40556803), geographic representation of the residue data is adequate for summer squash. A total of seven tests reflecting the maximum use rate and the specified 0-day PHI have been conducted on summer squash in CA(3), FL, IN, NY, TX.

With the submission of the above cucumber and squash field trials, residue data requirements have been fulfilled for the cucurbit vegetables crop group. Adequate residue data are available from a total of 22 field trials on representative cucurbit vegetables (8 - cucumber, 7 - melon, and 7 - summer squash). In each of these studies, crop samples were harvested immediately (0-day) following the last of eight broadcast foliar applications of permethrin (EC formulations) at 0.2 lb ai/A/application, for a total of 1.6 lb ai/A/season (1x). Maximum residues of permethrin detected were 0.11-0.52 ppm in/on cucumbers, 0.06-1.1 ppm in/on melons, and 0.19-0.92 ppm in/on summer squashes. These data indicate that the current 3 ppm tolerance is too high and could be lowered to 2 ppm. The tolerance will be reevaluated at the time of the *Reregistration Eligibility Decision Document*.

Although data reflecting use of a WP formulation on cucurbit vegetables are not available, side-by-side trials using EC and WP formulations on apples, celery, broccoli, and spinach indicate that permethrin residues resulting from application of an EC formulation are consistently higher or no different than permethrin residues resulting from application of a WP formulation. Therefore, no additional data are required reflecting the use of a WP formulation on cucurbit vegetables.

MASTER RECORD IDENTIFICATION NUMBER

- 44182701 Thompson, D. (1996) Permethrin: Magnitude of Residue on Cucumber: (Final Report): Lab Project Number: PR 05126:05126.92-MSR03: 05126.92-CA54. Unpublished study prepared by Interregional Research Project No. 4. 396 p.
- 44182702 Thompson, D. (1996) Permethrin: Magnitude of Residue on Squash (Summer): (Final Report): Lab Project Number: PR 05127: A5127:05127.92-FL23.

 Unpublished study prepared by Interregional Research Project No. 4. 421 p.

Table 3. Residues of permethrin and its metabolites, DCVA and 3-PBA, in/on cucumbers (MRID 44182701) harvested 0 or 1 day following the last of eight applications of permethrin at ~0.2 lb ai/A, totaling 1.6 lb ai/A/season (1x).

Location		Applicatio	n Data		Residues (ppm) '						
	Formulation	Rate (lb ai/A)	Number * of Application	PTI ^h (hours)	cis- Permethrin	<i>trans-</i> Permethrin	cis-DCVA	trans-DCVA	3-PBA	Total Permethrin ^d	
Fresno, CA	2 lb/gal EC	0.2	8	22	< 0.05	< 0.05	< 0.05	< 0.05	< 0.10	< 0.10	
		ĺ		[< 0.05	< 0.05	< 0.05	< 0.05	< 0.10	< 0.10	
					< 0.05	< 0.05	< 0.05	< 0.05	< 0.10	< 0.10	
					< 0.05	< 0.05	< 0.05	< 0.05	< 0.10	< 0.10	
Stedman, NC	2 lb/gal EC	EC 0.18	8	4	0.18	0.18	< 0.05	0.09	< 0.10	0.36	
					0.16	0.16	< 0.05	0.09	< 0.10	0.32	
]				0.10	0.13	< 0.05	0.07	< 0.10	0.23	
				,	0.14	0.15	< 0.05	0.07	< 0.10	0.29	
Fremont, OH	2 lb/gal EC	0.2	8	2	< 0.05	< 0.05	< 0.05	< 0.05	< 0.10	< 0.1	
					0.08	0.07	< 0.05	< 0.05	< 0.10	0.15	
					0.09	0.08	< 0.05	< 0.05	< 0.10	0.17	
			İ		0.08	0.07	< 0.05	< 0.05	< 0.10	0.15	

^a Applications were made at 4- to 11-day retreatment intervals.

b Hours after final application.

Expressed in terms of each analyte.

d Sum of cis- and trans-permethrin.

Location (year)	Application Data				Residues (ppm) "					
	Formulation	Rate (lb ai/A)	Number 2 of Applications	PTI	cis- Permethrin	trans- Permethrin	cis-DCVA	irans-DCVA	3-PBA	Total Permethrin '
Gainesville, FL	2 lb/gal EC	0.2	8	3 days	< 0.05	< 0.05	< 0.10	< 0.10	< 0.10	< 0.1
(1992)					0.074	< 0.05	< 0.10	< 0.10	< 0.10	≤0.124
]				0.066	< 0.05	< 0.10	0.119	< 0.10	≤0.116
					0.067	< 0.05	< 0.10	< 0.10	< 0.10	≤0.117
Gainesville, FL (1995)	3.2 lb/gal EC	0.2	8	12 hours	0.18, 0.25 (0.22) ^d	0.13, 0.18 (0.16)	< 0.10	0.15	< 0.10	0.38
				0.21, 0.19 (0.20)	0.16, 0.14 (0.15)	< 0.10	0.17	0.11	0.35	

^{*} Applications were made at 4- to 7-day retreatment intervals.

b Expressed in terms of each analyte.

^c Sum of cis- and trans-permethrin.

^d Values in parentheses are the mean of duplicate analyses of a single sample.



R123757

Chemical: Permethrin

PC Code: 109701

HED File Code: 11100 Other Chemistry Documents

Memo Date: 2/26/1997 File ID: DPD232398 Accession #: 412-06-0193

HED Records Reference Center 7/18/2006